

**INTERFACE REQUIREMENTS
DOCUMENT**

Between the

**EARTH OBSERVING SYSTEM DATA
AND
INFORMATION SYSTEM
(EOSDIS)**

and the

**TROPICAL RAINFALL MEASURING
MISSION
(TRMM)**

GROUND SYSTEM

February 1995

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

423-10-04	Memorandum of Understanding Between the Tropical Rainfall Measuring Mission (TRMM) Project and the EOS Ground System and Operations Project (GSOP) for Science Data Archive and Distribution Support, October 1991, NASA/GSFC.
423-10-01-1	Earth Science Data and Information System (ESDIS) Level 2 Requirements EOSDIS Core System (ECS), Volume 1, January 27, 1993.
193-216-SE1-001	EOSDIS Core System (ECS) Requirements Specification (latest revision).
490-03	TRMM System Specification Ground Segment, March 1993.
423-41-01	EOSDIS Core System Statement of Work, 21 May 1993, NASA/GSFC.
193-208-SE1-001	Methodology for Definition of External Interfaces, submitted May 1994.

2.2 Applicable Documents

The following documents are directly applicable to the specification of the requirements in this document. In the event of conflict between any of these documents and this document, the conflict will be resolved by submitting Configuration Change Requests to the appropriate CCBs in order to change requirements that are under CCB document control such as the TRMM Detailed Mission Requirements or the memorandum of understanding.

193-301-DV1-001	ECS System Implementation Plan, submitted August 1993.
490-080	Tropical Rainfall Measuring Mission (TRMM) Operations Concept, July 1993.
490-010	TRMM Project Data Management Plan, June 1993.
500-135	Detailed Mission Requirements (DMR-2) for TRMM, November 1993.

<u>TSDIS-1994-REQ-00026</u>	TRMM Science Data and Information System (TSDIS) Requirements Specification <u>Document</u> , TBD date, etc., <u>March</u> <u>1995</u> .
560-1ICD/1292	ICD Between IPD DDF Phase III and Consumer Systems (draft).
560-1ICD/0893	ICD Between IPD and Pacor II Customers (draft).
560-1ICD/0793	ICD Between IPD DDF Phase III and IPD Source Systems and the FDF (draft).
193-604-OP1-001	ECS Operations Concept Document for the ECS Project, submitted August 1993.

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

193-202-SE1-001	ECS Standards and Procedures, August 1993.
193-201-SE1-001	Systems Engineering Plan for the ECS Project, submitted May 1993.
	TRMM Science Volume Estimates, Version 2.

**Table 3-1. TRMM Ground System Level Interfaces
& Responsibility for Development**

	Physical Interface (From)	Physical Interface (To)	Interface Function	Data Flow	ICD Development Responsibility	Contact Person	Dates
1	GSFC SDPF	ECS MSFC DAAC	For processing Level 0 Data at MSFC (LIS Production Data Sets)	Level 0, Q/L, Definitive & Predicted Orbits (via SDPF)	R TRMM Project R EOSDIS P MO&DSD S SDPF R/S MSFC DAAC	L. Brown T. Ackerson MOM/DSM G. Henegar C. Lapenta	I/F 12/95 ICD 5/95 T/P 6/94
2	GSFC SDPF	ECS LaRC DAAC	For processing Level 0 Data at LaRC (CERES Production Data Sets)	Level 0, Q/L, Definitive & Predicted Orbits (via SDPF)	R TRMM Project R EOSDIS P MO&DSD S SDPF R/S LaRC DAAC	L. Brown T. Ackerson MOM/DSM G. Henegar C. Harris	I/F 12/95 ICD 5/95 T/P 6/94
3	GSFC TSDIS	ECS MSFC DAAC	archive original + reprocessed data products (related to PR, TMI, <u>combined</u> , & GV)	Level 1A-3 data products, Metadata, browse, Algorithms, Documentation, Availability Schedule & Status	R TRMM Project P EOSDIS R/S TSDIS R/S MSFC DAAC	L. Brown T. Ackerson G. Kim C. Lapenta	I/F 9/96 ICD 5/95 T/P
4	GSFC TSDIS	ECS GSFC DAAC	archive original + reprocessed (related to VIRS)	Level 1A-3 & 1B data products, Metadata, browse, Algorithms, Documentation, Availability Schedule & Status	R TRMM Project P EOSDIS R/S TSDIS R/S GSFC DAAC	L. Brown T. Ackerson G. Kim P. Chan	I/F 9/96 ICD 5/95 T/P
5	ECS DAAC	GSFC TSDIS	Production & reprocessing (ancillary data)	Correlative, ancillary data (MSFC --> SSM/I, GPCP, GPCC) (GSFC --> GPCP, GPI, NMC)	R TRMM Project P EOSDIS S/R TSDIS S MSFC DAAC S GSFC DAAC	L. Brown T. Ackerson G. Kim C. Lapenta P. Chan	I/F 9/96 ICD 5/95 T/P
6	ECS MSFC DAAC	GSFC TSDIS	For reprocessing by TSDIS (related to PR, TMI, GV, and <u>combined</u> products archived at ECS MSFC DAAC)	Archived Level 1A-3 data products, Metadata, browse, algorithms, documentation, GV, & Ancillary	R TRMM Project P EOSDIS R/S TSDIS R MSFC DAAC	L. Brown T. Ackerson G. Kim C. Lapenta	I/F 9/96 ICD 5/95 T/P
7	ECS GSFC DAAC	GSFC TSDIS	For reprocessing at TSDIS (related to VIRS data products archived at ECS GSFC DAAC)	Archived Level 1A-3-1B data products, Metadata, browse, algorithms, documentation, & ancillary	R TRMM Project P EOSDIS S/R TSDIS S GSFC DAAC	L. Brown T. Ackerson G. Kim P. Chan	I/F 12/95 ICD 5/95 T/P

Table 3-1. TRMM Ground System Level Interfaces & Responsibility for Development

Physical Interface (From)	Physical Interface (To)	Interface Function	Data Flow	ICD Development Responsibility	Contact Person	Dates
8 GSFC SDPF	GSFC TSDIS	For processing L0 data at TSDIS (PR, TMI, VIRS production data sets)	Level 0, Q/L, Definitive Orbit, & Predictive Orbit Data (via SDPF from FDF)	R TRMM Project P MO&DSD R/S TSDIS S SDPF	L. Brown MOM/DSM G. Kim G. Henegar	I/F 12/95 ICD 5/95 T/P 6/94

Legend: **P- Primary or Lead Responsibility**
 S - Support Responsibility
 R - Review Responsibility

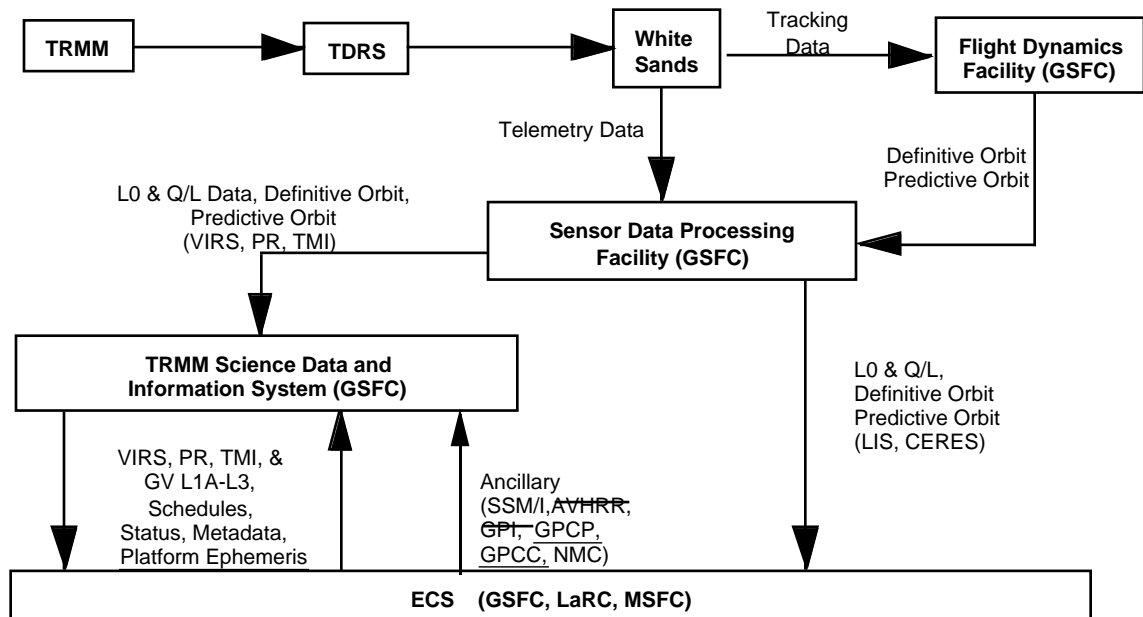


Figure 3-1. Top-Level View of TRMM and ECS

There are 4 elements of ECS that play specific roles in ECS-TRMM data system interfaces:

- MSFC DAAC
- LaRC DAAC
- GSFC DAAC
- ECS SMC

The **MSFC DAAC** supports research in the discipline areas of passive microwave remote sensing of the atmosphere, atmospheric electricity and lightning detection, and global hydrologic and atmospheric modeling. The primary data sets of interest at the MSFC

DAAC include data from the Special Sensor Microwave Imager (SSM/I), the Special Sensor for Microwave Temperature (SSM/T and SSM/T2), and the Microwave Sounding Unit (MSU). In addition, the MSFC DAAC will obtain Global Precipitation Climatology Project (GPCP) and Global Precipitation Climatology Centre ancillary data, for archive and distribution to TSDIS. The MSFC DAAC will have responsibility for product generation, archive, and distribution of data from the EOS-developed LIS instrument flown onboard the TRMM observatory. The MSFC DAAC will also have responsibility for archive and distribution of the TMI and PR data and GV data.

The **LaRC DAAC** supports research in the discipline areas of radiation budget, clouds, aerosols, and tropospheric chemistry. Primary data sets of the LaRC DAAC are those of the Earth Radiation Budget Experiment (ERBE), Stratospheric Aerosol Measurement-II (SAM-II) and Stratospheric Aerosol and Gas Measurement (SAGE) experiments, and the International Satellite Cloud Climatology Program (ISCCP). LaRC will have responsibility for product generation, archive, and distribution of the EOS-developed CERES instrument data that is flown onboard the TRMM observatory.

The **GSFC DAAC** supports research in the discipline areas of the upper atmosphere, atmospheric dynamics, global biosphere, and geophysics. The GSFC DAAC supports over 150 data sets, most of which are developed from heritage data centers concerned with climate, lands, and ocean data. The DAAC also supports the initial NOAA Advanced Very High-Resolution Radiometer (AVHRR) and TOVS data to be used in the development efforts of the NASA Pathfinder data sets. The GSFC DAAC will also have responsibility for archive and distribution of data products for the Visible Infrared Scanner (VIRS) instrument flown onboard the TRMM observatory.

The **ECS SMC** serves as a repository for system management information about policy, future schedules and plans, resources, maintenance activities, security, and accounting. SMC interfaces with TRMM for coordination. SMC receives all pertinent schedule impacts for TSDIS and SDPF.

3.2 TRMM

The TRMM is a Mission to Planet Earth mission designed to advance our understanding of total rainfall and to determine the rate of rainfall and the total rainfall occurring over the tropics and subtropics (less than 35 degree latitude). TRMM is also designed to facilitate the measurement and analysis of the Earth's radiant energy budget and lightning. The mission is a joint venture between NASA and the National Space Development Agency of Japan (NASDA). The TRMM observatory will be launched in August 1997, and will carry the following instruments:

Visible Infrared Scanner (VIRS)

TRMM Microwave Imager (TMI)

Precipitation Radar (PR, provided by NASDA)

LIS (an EOS instrument)

CERES (an EOS instrument).

3.2.1 TSDIS

The TSDIS is the TRMM science data processing and information system. Located at GSFC, the TSDIS will house a TRMM Science Data Operations Center (SDOC), and a Science Operations Control Center (SOCC). The TSDIS will process PR, TMI, VIRS, and GV data and generate various levels of standard data products. The TSDIS-generated science data products will be made available to members of the TRMM TSDIS Science Team Users (TSUs) through Remote Science Terminals (RST). In addition, the standard TRMM data products will be transferred from the TSDIS to the ECS for archive, access, and distribution to the research user communities.

TSDIS will also have the capability to function as a proxy to request data from ECS for the TSUs, check on the status of the data requests, and cancel the data requests; ECS will provide the requested data directly to the TSUs.

3.3 Institutional Support Systems

GSFC and other NASA organizations provide various institutional capabilities for support of satellite missions in areas such as mission control, data capture, and communications. There are institutional support systems that both TSDIS and ECS must interface with in order to acquire science and ancillary data. Also, these systems provide mission operations, controls, and data systems support services. These institutional support systems are described below.

3.3.1 Flight Dynamics Facility (FDF)

The FDF provides mission operations, analysis, and planning support to TRMM. This support is provided during both normal and contingency operations and includes orbit determination and control, attitude determination and control, and planning data.

3.3.2 Sensor Data Processing Facility (SDPF)

The SDPF at GSFC is responsible for the TRMM real-time and playback (quick-look and level zero) data processing and distribution. The SDPF receives the TRMM real-time and playback telemetry data stream from the SN-GN-DSN via Nascom, processes the telemetry data, and provides TRMM with real-time data distribution services, raw data storage, data quality accounting, and routine data production such as quick-look and level-zero data sets. For distribution, the SDPF will route the production data packets to TSDIS, the ECS MSFC and LaRC DAACs, and the NASA/NASDA interface.

3.3.3 Nascom

The Nascom Network is responsible for providing world-wide voice and data communications circuits and services among the TRMM ground elements, communications circuits between the SDPF and ECS LaRC and MSFC DAACs for transport of Level 0 CERES and LIS data, and the NASA/NASDA interface. NASDA will receive TRMM data

4. Data Flow Descriptions

This section provides high-level data flow descriptions for the TRMM and ECS interfaces. The section is divided into several functional areas, including those for Planning and Scheduling, TRMM Science Data, and Reprocessing.

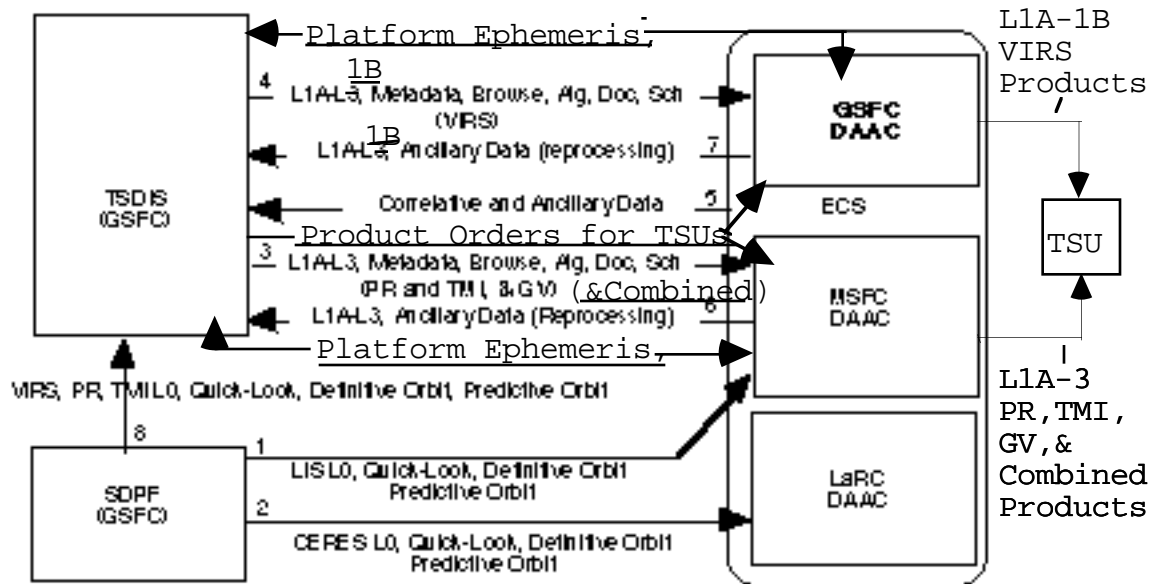


Figure 4-1. Lower-Level TRMM-ECS Interfaces

4.1 Planning and Scheduling

4.1.1 Planning Aids

TRMM planning aids are provided for the TRMM mission by the GSFC FDF and the MOC.

4.1.2 Quick-look Data

Quick-look data is a special case of the planning tools available from the TRMM project. The SDPF will generate quick-look data sets from one spacecraft contact of data (up to three times per day) and will make these data sets available within 2 hours to TSDIS for PR, TMI, and VIRS quick-look data and to ECS LaRC and MSFC DAACs for CERES and LIS quick-look, respectively.

4.2 TRMM Science Data

The TRMM Observatory will be in contact with TDRSS for about 20 minutes every orbit. Real-time and playback data will be relayed through TDRSS to the TRMM ground system elements located at GSFC. Data arriving at GSFC SDPF is processed to Level 0 within 48 hours of observation. Level 0 (Science and Housekeeping (H/K)) data and quick-look data for PR, TMI, and VIRS are transferred via Nascom networks to TSDIS; Level 0 (Science and H/K) data and quick-look data for CERES and LIS are transferred via Nascom networks to the LaRC and MSFC DAACs, respectively. TRMM will process Level 0 data and provide science data products, metadata, and browse to the ECS MSFC or GSFC DAAC while complying with ESDIS-defined standards. Product formats will be jointly agreed to and documented in ICDs. The following sections elaborate the operations concepts for science data flow along these two paths.

4.2.1 PR, TMI, VIRS, and GV

TRMM science data products for the PR, TMI and VIRS instruments and GV will not be available for general distribution until about 6 months following launch. The first 6 months of mission operations will be used for observatory check-out, testing, and for calibration and validation of the initial TRMM product generation algorithms.

During routine operations TSDIS will deliver Level 1A and higher level data products for PR, TMI, VIRS, and TRMM Ground Validation (GV) data to ECS. The GV is the ground-based rain gauge and rainfall radar data obtained from sites around the world and is used for calibrating and validating the space-based developed TRMM rainfall data products. Level 1A data products (which include the TRMM Platform Ephemeris files used for generating these products) will be delivered to ECS within 24 hours of TSDIS receipt of the Level 0 data from SDPF. Higher level data products will be delivered within 24 hours of the receipt of all required input data products at TSDIS. PR, TMI, combined products (based on data from more than one instrument), and GV data will be delivered to the MSFC DAAC; VIRS data will be delivered to the GSFC DAAC. Appendix A provides volume estimates for science data that TSDIS will generate on a daily basis. TSDIS will provide PR, TMI, combined, VIRS, and GV data to ECS in ESDIS-defined standards, with specific product formats to be jointly agreed to and documented in ICDs. The SDPF will provide the PR, TMI, and VIRS data sets to NASDA via the GSFC designated interface point.

4.2.2 CERES and LIS

SDPF generates CERES and LIS Level 0 data and transfers the data via Nascom to the ECS LaRC and MSFC DAACs, respectively. Each DAAC is responsible for all higher level data product generation, data archive and distribution.

4.3 Reprocessing

The TRMM Project expects to conduct reprocessing of all PR, TMI, VIRS, combined, and GV higher-level data products. The ECS MSFC and GSFC DAACs will provide archive, access, and distribution services for TRMM science data products. These DAACs will

receive requests from TSDIS for archived PR, TMI, VIRS, GV, combined, and required ancillary data stored at the DAACs. ECS will support TRMM reprocessing by providing each day an average of 2 days worth of data to TRMM for reprocessing. After reprocessing, the TSDIS will deliver higher-level products for PR, TMI, VIRS, combined, and GV to ECS. Earlier versions of TRMM science data that are archived at the DAACs will be kept for 6 months following the receipt of reprocessed data. After 6 months, the earlier data product versions will be purged.

TRMM2190	The ECS systems at the MSFC DAAC shall ingest predicted orbit data from the SDPF.
TRMM2200	ECS systems at the MSFC DAAC shall ingest definitive orbit data from the SDPF.
TRMM2270	ECS shall be able to accept LIS simulated data from SDPF.

5.3 TSDIS<->MSFC DAAC Interface Functional and Performance Requirements

The requirements for this interface are as follows:

TRMM3010	The ECS systems at the MSFC DAAC shall ingest TRMM standard products (Level 1A- 3B) for PR and TMI, <u>and combined products,</u> from TSDIS.
TRMM3020	<u>The ECS systems at the MSFC DAAC shall ingest TRMM Platform Ephemeris from TSDIS.</u>
TRMM3030	The ECS systems at the MSFC DAAC shall ingest TRMM browse products for PR, TMI and GV, <u>and combined products,</u> from TSDIS.
TRMM3040	The ECS systems at the MSFC DAAC shall ingest algorithms and documentation for PR and TMI, <u>GV, and combined products,</u> from TSDIS.
TRMM3050	The ECS systems at the MSFC DAAC shall ingest TRMM Ground Validation (GV) data products and associated metadata from TSDIS.
TRMM3060*	The PR, TMI, and GV data, <u>and combined products,</u> ingested from TSDIS by ECS shall be archived in the ECS systems at the MSFC DAAC.
TRMM3070	The ECS systems at the MSFC DAAC shall ingest TRMM data files and data products, including metadata, daily.
TRMM3080	TSDIS shall electronically provide a schedule of TRMM product availability to the ECS systems at the MSFC DAAC.
TRMM3090	TSDIS shall electronically provide status information to the ECS systems at the MSFC DAAC about delayed products.
TRMM3100	ECS shall make daily deliveries of an average of 2-days worth of archived TRMM PR, TMI, GV, <u>and combined products;</u> and <u>SSM/I, GPCP, and GPCC</u> ancillary data to TSDIS for the purpose

of reprocessing by TSDIS. ECS also shall daily ingest an average of 2-days worth of reprocessed data from TSDIS.

TRMM3110	TRMM <u>TSDIS</u> shall make a standing order to ECS for SSM/I, GPCP, and GPCC data to be delivered from the ECS systems at the MSFC DAAC to TSDIS.
TRMM3111	<u>The ECS systems at the MSFC DAAC shall accept data orders that TSDIS places on behalf of TSDIS Science Users (TSUs) by specifying TSDIS granule identification numbers.</u>
TRMM 3112	<u>The ECS systems at the MSFC DAAC shall accept requests from TSDIS for the status of data orders that TSDIS has placed on behalf of TSUs.</u>
TRMM3120	Communications between TSDIS and the ECS systems at the MSFC DAAC to transport the PR, TMI, <u>combined,</u> and GV standard products, metadata; SSM/I, GPCP, and GPCC ancillary data; algorithms, and documentation shall be provided by ESDIS.
TRMM3130	All data transferred between TSDIS and the ECS systems at the MSFC DAAC, including GV, shall follow ESDIS-defined standards with specific product formats to be jointly agreed to and documented in ICDs.

5.4 TSDIS<->GSFC DAAC Interface Functional and Performance Requirements

The requirements for this interface are as follows:

TRMM4010	The ECS systems at the GSFC DAAC shall ingest TRMM standard products (Level 1A-31B) for VIRS from TSDIS.
TRMM4020	<u>The ECS systems at the GSFC DAAC shall ingest TRMM Platform Ephemeris from TSDIS.</u>
TRMM4030	The ECS systems at the GSFC DAAC shall ingest TRMM browse products for VIRS from TSDIS.
TRMM4040	The ECS systems at the GSFC DAAC shall ingest from TSDIS algorithms and documentation for VIRS.
TRMM4050	The VIRS data ingested from TSDIS by ECS shall be archived in the ECS systems at the GSFC DAAC.
TRMM4060	The ECS systems at the GSFC DAAC shall ingest TRMM data files and data products, including metadata, daily.
TRMM4070	TSDIS shall electronically provide a schedule of TRMM product availability to the ECS systems at the GSFC DAAC.

TRMM4080	TSDIS shall electronically provide status information to the ECS systems at the GSFC DAAC about delayed products.
TRMM4090	ECS shall make daily deliveries of an average of 2-days worth of archived TRMM VIRS, GOES Precipitation Index (GPI) , and National Meteorological Center (NMC) ancillary data to TSDIS for the purpose of reprocessing by TSDIS. ECS shall also daily ingest an average of 2-days worth of reprocessed data from TSDIS.
TRMM4100	TSDIS shall make a standing order to ECS for GPCP, GPI, and NMC ancillary data to be delivered from the ECS systems at the GSFC DAAC to TSDIS.
TRMM4110	Communications between TSDIS and the ECS systems at the GSFC DAAC to transport the VIRS standard products, metadata, GPCP, GPI, and NMC ancillary data, and algorithms and documentation shall be provided by ESDIS.
<u>TRMM4111</u>	<u>The ECS systems at the GSFC DAAC shall accept data orders that TSDIS places on behalf of TSDIS Science Users (TSUs) by specifying TSDIS granule identification numbers.</u>
<u>TRMM 4112</u>	<u>The ECS systems at the GSFC DAAC shall accept requests from TSDIS for the status of data orders that TSDIS has placed on behalf of TSUs.</u>
TRMM4130	All data transferred between TSDIS and the ECS systems at the GSFC DAAC shall follow ESDIS-defined standards, with specific product formats to be jointly agreed to and documented in ICDs.

5.5 TSDIS<->ECS Information Management Interface Functional and Performance Requirements

The requirements for this interface are as follows:

TRMM5010	ECS shall ingest TRMM metadata, and browse from TSDIS along with the TRMM standard products in the ECS format.
TRMM5020	Availability of TRMM data products (PR, VIRS, TMI, and GV) shall be based on the TSDIS product schedule, and an electronic status mechanism shall be available for late products.
TRMM5030	ECS shall have the capability to ingest directory and guide information from TSDIS.
TRMM5040	ECS shall have the capability to archive and distribute standard TRMM data files and products (including VIRS, PR and TMI data, <u>combined data</u> , metadata, GV data, algorithms and documentation)

as provided and produced by TSDIS and the TRMM Science Team.

- TRMM5050 TRMM shall support maintenance of a TRMM user model for use in the overall ECS user model.
- TRMM5060 ECS shall provide standard information management functions for browse, and order of data and products provided by TSDIS and delivered to the MSFC and GSFC DAACs (including VIRS, PR and TMI data, combined data, metadata, GV data, TRMM Science Team algorithms and documentation).
- TRMM5070 ECS will continue to retain original TRMM standard products (Level 1B-3) after reprocessing for 6 months, after which the products will become eligible for deletion.
- TRMM5100 ECS shall provide products status for TRMM products to users based upon ECS holdings. ~~Status also shall be based on the TRMM schedule provided electronically by TSDIS and an interactive status mechanism for late products.~~

6. Interface Control Documentation

External ICDs define the functional and physical design of each interface between ECS and an external system as identified in this IRD. Several ICDs will be prepared to supplement this IRD, and traceability will be maintained between the interfaces described in the two sets of documents. An ICD includes the precise data contents and format of each interface. All modes (options) of data exchange for each interface are described as well as the conditions required for each mode or option. Additionally, data rates, duty cycles, error conditions, and error handling procedures are included. The sequence of exchanges is completely described (e.g., required handshaking.) Communications protocols or physical media are detailed for each interface. Responsibilities for preparation of ICDs are delineated in Table 3-1.

One ICD will be prepared to specify the design of the interfaces between each pair of interfacing organizations. Preliminary versions of the TRMM-ECS ICDs are scheduled for ECS Release A PDR - 2 weeks ~~(November 1994)~~. Final versions of the ICDs are scheduled for ECS Release A CDR - 2 weeks ~~(May 1995)~~.

TRMM8130	SDPF shall support the TRMM ground system and ECS integration and test with Level 0 data and quick-look data sets produced from simulated data.
TRMM8150	ECS shall support early dataflows and provide archival and distribution functionality in support of test driven from SDPF by simulated instrument data and including TSDIS sample products.
TRMM8160	ECS shall provide ancillary (i.e. GPCP, <u>GPCC</u> , SSM/I, NMC analysis, GPI) data for early interface testing.
TRMM8170	During Integration and test and early operation of the TRMM Ground System, ECS shall support controlled distribution of TRMM data.
TRMM8180	ECS shall distribute TRMM test products, algorithms and documentation to TST members and authorized users supporting TRMM end-to-end test.
TRMM8190	The I&T testing of communications and networks shall not interfere with normal operations traffic.

Appendix A. Data Volumes and Loading

TRMM Product Volume Estimates (MB/day)

Processing	VIRS	TMI	PR	Combined	GV	TOTAL
Level-0	(477.2)	(89.1)	(967.3)		(2175.3)	(3708.5)
Level-1A	495.9	102.3	970.1		0	1568.3
Level-1B	1394.1	214.3	2104.4		26.8	4439.6
Level-1C	0	0	2104.4		3434.4	5538.8
Level-2A	0	1378.3	3139.4		562.8	5080.5
Level-2B	0	0	0	889.6	0	889.6
Level-3A	0	<0.1	0.1		1.2	1.3
Level-3B	0	0	0	0.1	0	0.1
Browse	8.0	16.0	40	8.0	90.3	162.3
TOTAL	1898.0	1710.8	8358.4	897.7	815.5	17680.4

Note: () indicates not archived by ECS.

TRMM Ancillary Data Volume Estimates (MB/day)

Instrument	Data Volume (in Mega Bytes)
SSM/I L1B	240 (per day)
GPCP— <u>GPCC</u>	1.5 (per year)
Gridded NMC fields from model analysis	5 (per day)
GPI <u>GPCP</u> 1x1 degree daily histograms	1,000 (per month)

Notes: The 240 MB/day represents availability of 3 SSM/I satellites.

Appendix B. Requirements Trace and Sources of Ancillary Data

Table B-1. TRMM IRD Requirements Trace to ECS Requirements Specification (1 of 3)

Requirement Number	Parent Requirements (D/ = Derived From ...)
TRMM1010	EOSD1607 SDPS0020
TRMM1020	EOSD1608 SDPS0020
TRMM1030	SDPS0020/D
TRMM1040	DADS0320
TRMM1050	DADS2020
TRMM1060	EOSD1607/D
TRMM1070	DADS2040
TRMM1080	SDPS0020/D
TRMM1090	SDPS0020/D
TRMM1100	SDPS0020/D
TRMM1110	EOSD1607/D
TRMM1120	SDPS0020/D
TRMM1130	EOSD1607/D DADS0130
TRMM1140	SDPS0020/D
TRMM1150	DADS2020
TRMM1160	SDPS0020/D
TRMM1170	SDPS0020/D
TRMM1180	DADS0320
TRMM1190	DADS1450/D
TRMM1200	IMS-0510 ICC-7220
TRMM1210	EOC-2010 IMS-0510
TRMM1280	IMS-1130
TRMM2010	EOSD1607 SDPS0020
TRMM2020	EOSD1608 SDPS0020
TRMM2030	SDPS0020/D

**Table B-1. TRMM IRD Requirements Trace to ECS
Requirements Specification (2 of 3)**

TRMM2040	DADS0320
TRMM2050	DADS2020
TRMM2060	EOSD1607/D
TRMM2070	DADS2040
TRMM2080	SDPS0020/D
TRMM2090	SDPS0020/D
TRMM2100	SDPS0020/D
TRMM2110	EOSD1607/D
TRMM2120	SDPS0020/D
TRMM2130	EOSD1607/D <u>DADS0130</u>
TRMM2140	SDPS0020/D
TRMM2150	DADS2020
TRMM2160	SDPS0020/D
TRMM2170	DADS0320
TRMM2180	DADS1450
TRMM2190	IMS-0510 ICC-7220
TRMM2200	EOC-2010 IMS-0510
TRMM2270	IMS-1130
TRMM3010	EOSD1607 EOSD1608 SDPS0020
TRMM3020	EOSD1607 EOSD1608 SDPS0020
TRMM3030	EOSD1607/D
TRMM3040	EOSD1607 EOSD1608 SDPS0020
TRMM3050	EOSD1750 EOSD1608 SDPS0020
TRMM3060	EOSD1607 SDPS0080 DADS0475
TRMM3070	DADS2020
TRMM3080	DADS2020
TRMM3090	DADS2020/D
TRMM3100	EOSD1607/D
TRMM3110	IMS-0880
TRMM3120	ESN0080
TRMM3130	DADS0320

Sources of Ancillary Data (TBR)

The TRMM ancillary data consist of the following:

SSM/I Level 1B

GPI

GPCP

GPCC

NMC/ECMWF (European Center for Medium Range Weather Forecasts) gridded analyses

~~SSM/I Level 1B is a data product that should be available to ECS electronically from MSFC. MSFC presently receives and processes the SSM/I data from FNMOC/NESDIS. TRMM's requirements for SSM/I are under investigation to determine the suitability of the SSM/I data as processed by MSFC. LIS requires full resolution SSM/I data as produced by FNMOC/NESDIS.~~

NMC analyses are available to ECS electronically from GSFC, which obtains the data from NOAA.

~~ECS has already had numerous EOS investigators list NMC gridded analyses as required ancillary input to their science processing. NMC analyses are expected to be available electronically through the NESDIS on-line system or even directly from NMC itself. Ricky Rood (NASA/GSFC/Data Assimilation Office) is involved in an effort to ingest NMC data.~~

GPI-GPCP Satellite-Derived (IR) Monthly Rainfall Estimates is available to ECS electronically from MSFC. MSFC obtains the data from is currently being generated at NMC NESDIS, and should also be is available electronically from NMC and/or NESDIS. Access and availability is not expected to be a problem since the product is being derived by an NMC NESDIS scientist (Phil Arkin) who is a member of the TRMM Science Team.

GPCC Global Precipitation is available to ECS electronically from MSFC. It is produced by the Global Precipitation Climatology Center in Frankfurt, Germany.

Abbreviations and Acronyms

AVHRR	Advanced Very High-Resolution Radiometer
APID	Applications ID
CCB	Configuration Control Board
CCSDS	Consultative Committee for Space Data Systems
CDRL	Contract Data Requirements List
CERES	Clouds and Earth's Radiant Energy System
COTS	Commercial Off-the-Shelf
DAAC	Distributed Active Archive Center
DADS	Data Archive and Distribution System
DID	Data Item Description
DCN	Document Change Notice
DSM	Data Systems Manager
DDF	Data Distribution Facility
DMR	Detailed Mission Requirements
DSN	Deep Space Network
ECMWF	European Center for Medium Range Weather Forecasts (UK)
Ecom	EOS Communications
ECS	EOSDIS Core System
EDOS	EOS Data and Operations System
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
ESDIS	Earth Science Data and Information System
FDF	Flight Dynamics Facility
<u>FNMOCC</u>	<u>Fleet Numerical Mission Operations Center</u>
FOT	Flight Operations Team
GN	Ground Network
GOES	Geostationary Operational Environmental Satellite

<u>GPCC</u>	<u>Global Precipitation Climatology Centre</u>
GPCP	Global Precipitation Climatology Project
GPI	GOES Precipitation Index
GSFC	Goddard Space Flight Center
GSOP	Ground System Operations Project
GTSIM	Generic Telemetry Simulator
GV	Ground Validation
HAIS	Hughes Applied Information Systems, Inc.
<u>H/K</u>	<u>Houskeeping, as in Level 0 Housekeeping data</u>
ICD	Interface Control Document
IMS	Information Management System
<u>IR</u>	<u>Infrared</u>
IRD	Interface Requirements Document
ISCCP	International Satellite Cloud Climatology Program
ISO	International Standards Organization
LaRC	Langley Research Center
LIS	Lightning Imaging Sensor
LTSP	Long Term Science Plan
MOC	Mission Operations Center
MO&DSD	Mission Operations and Data Systems Directorate
MOM	Mission Operations Manager
MOU	Memoranda of Understanding
MSFC	Marshall Space Flight Center
MSU	Microwave Sounding Unit
NASA	National Aeronautical and Space Administration
NASDA	National Space Development Agency of Japan
Nascom	NASA Communications
<u>NESDIS</u>	<u>National Environmental Satellite Data and Information Service</u>
NMC	National Meteorological Center (NOAA)
NOAA	National Oceanic and Atmospheric Administration
NSI	NASA Science Internet
OLS	Optical Line Scanner

OSI	Open System Interconnect
Pacor	Packet Processor
Q/L	Quick-look
PR	Precipitation Radar
RST	Remote Science Terminal
SCF	Science Computing Facility
SDOC	Science Data Operations Center
SDPF	Sensor Data Processing Facility
SFDU	Standard Format Data Unit
SN	Space Network
SOCC	Science Operations Control Center
SRR	System Requirements Review
SSM/I	Special Sensor Microwave/Imager
SSM/T	Special Sensor Microwave/Temperature Sounder
TBD	To Be Determined
TBR	To Be Reviewed
TCXO	Transponder Crystal-Controlled Oscillator
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TMI	TRMM Microwave Imager
TOVS	TIROS Operational Vertical Sounder
TRMM	Tropical Rainfall Measuring Mission
TSDIS	TRMM Science Data and Information System
TST	TRMM Science Team
<u>TSU</u>	<u>TSDIS Science User</u>
VIRS	Visible Infrared Scanner